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**Childhood adversities and psychopathology among military
veterans in the US: the mediating role of social networks.**

McLafferty, M*., Ross, J., Waterhouse-Bradley, B., & Armour, C.

Ulster University, Cromore Road, Coleraine, Northern Ireland

Corresponding author:

Dr Margaret McLafferty, email: m.mclafferty@ulster.ac.uk, telephone: +353861551293

Abstract

Childhood adversities can impact negatively on psychological health across the lifespan. Many military veterans have a history of adverse childhood experiences, which when combined with deployment related traumas, can lead to high levels of psychopathology. Social networks can however be protective. The current study aimed to identify typologies of childhood adversity in U.S. military veterans ($n=3,092$) and explore relationships between the adversity typologies and PTSD, mood and anxiety disorders, utilising data from the National Epidemiological Survey on Alcohol and Related Conditions-III (NESARC-III). The mediating role of quality and quantity of social networks were examined. Latent class analysis identified four adversity classes; 1) baseline, 2) household dysfunction, 3) maltreatment, and 4) multi-adversity. Individuals in the adversity classes (2-4), especially those who experienced multi-adversity had higher rates of psychopathology. The quality of social networks played an important mediating role, while quantity of networks did not. Those who experienced adversity were less likely to have supportive social networks, therefore adversity had both a direct and indirect impact on psychopathology. The findings highlight the importance of developing and maintaining social networks following military life. Recommendations include interpersonal skills training and programmes which may help them engage back into the community and enhance relationships.

Key words: Social networks; Childhood adversities; Psychopathology; Veterans

1.0 Introduction

Adverse childhood experiences have been consistently associated with a heightened risk of mental health disorders (Felitti et al., 1998; Dube et al., 2003a; Kessler et al., 2010; Schilling et al., 2007). Childhood adversities are common (Copeland, Keeler, Angold & Costello, 2007) and often co-occur (Dong et al., 2004), especially those involving maltreatment and parental maladjustment, including family violence and parental mental illness, substance abuse and criminal behaviour (McLaughlin et al., 2010; McLafferty, Armour, McKenna, O'Neill, Murphy & Bunting, 2015)

Strong links have been revealed between adverse childhood experiences and a range of substance (Dube et al., 2003b), mood (Angst, Gamma, Rössler, Ajdacic, & Klein, 2011), anxiety (Hyland, Shevlin, Elklit, Christoffersen & Murphy, 2016) and suicidal behaviour (McLafferty, Armour, O'Neill, Murphy, Ferry, & Bunting, 2016). In particular, a strong, dose-response relationship has been found between the number of childhood adversities experienced and mental health problems (Edwards, Holden, Anda, & Felitti, 2003; Chapman et al., 2004). For example, Chapman et al. (2004) found that as the number of adverse childhood experiences increased so too did the likelihood of a person having depression. The onset and persistence of posttraumatic stress disorder (PTSD) is also strongly associated with the experience of early childhood adversities; especially those related to physical and sexual abuse or neglect (Copeland et al., 2007; Afifi, Boman, Fleisher & Sareen, 2009; McLaughlin et al., 2017).

For PTSD to be diagnosed, the onset of the symptoms must be preceded by a traumatic experience, such as sexual abuse, a life-threatening incident, combat experience

etc. Research has found, however, that adverse childhood experiences can exacerbate the impact of other traumatic experiences, leaving a person more susceptible to developing PTSD and other mental health problems such as mood and anxiety disorders (Brewin, Andrews & Valentine, 2000; Koenen, Moffitt, Poulton, Martin, & Caspi, 2007). It has been proposed that those who experience severe adversities in childhood often fail to develop adequate coping skills which can prevent them from dealing with stress sufficiently in the future (Breslau & Anthony, 2007; Zautra, 2009). Repeated exposure to adverse or stressful life events leads to heightened stress sensitivity, which can impact on psychological health. Furthermore, those who endured childhood adversities may be less likely to form social networks which can be protective in times of stress (Brewin et al., 2000).

Research suggests that those who endure adverse childhood experiences and low socio-economic status may be more likely to join the military (Blosnich, Dichter, Cerulli, Batten, & Bossarte, 2014; Katon et al., 2015), possibly as a means of escaping from such experiences. Indeed, higher rates of childhood adversities have been found in military populations when compared to the general population (Blosnich et al., 2014; Katon et al., 2015). For example, Katon et al. (2015) revealed that female military personnel had a total adverse childhood experience (ACE) score of 2.2, in comparison to 1.7 for female civilians. ACE scores for male military personnel was 1.6 in comparison to 1.3 for male civilians.

Through deployment, military personnel are at a heightened risk of encountering further traumatic experiences. The combination of childhood adversities, and military experiences can leave a person particularly susceptible to the development of mental illness. For example, studies have found that childhood adversities can interact with combat exposure, leading to more negative mental health outcomes (Cabrera, Hoge, Bliese, Castro &

Messer, 2007; Iversen et al., 2008) such as post deployment PTSD (LeardMann, Smith, & Ryan, 2010). Sareen and colleagues (2013) reported that childhood adversities and deployment experiences impact on mood and anxiety disorders, with the most negative outcomes reported when military personnel experienced trauma in both childhood and during their military career. Childhood adversities, however, displayed a very negative independent effect when controlling for deployment experiences.

Utilising data from the 2012-2013 National Epidemiologic Survey on Alcohol and Related Conditions - III (NESARC - III), Smith et al. (2016) revealed high lifetime prevalence rate of PTSD and comorbid mood and anxiety disorders among U.S. military veterans. Indeed, while many people assume that PTSD is the most common mental health problem found among veterans, studies have found that mood and anxiety disorders, or alcohol misuse are even more prevalent (Fear et al., 2010; Smith et al., 2016). Utilising the same dataset, veterans have also been found to have elevated levels of adverse childhood experiences (Evans, Upchurch, Simpson, Hamilton, & Hoggatt, 2018; Ross, Waterhouse-Bradley, Contractor, & Armour, 2018). It is important therefore to investigate factors which may mitigate the impact of early adversities and conflict related traumas on mental health.

Research suggests that while loneliness can have a detrimental effect on mental health following adverse childhood experiences (Shevlin, McElroy & Murphy, 2014), supportive social networks can be protective (Sperry & Widom, 2013), by attenuating physiological and psychological responses to stress. When describing the buffering hypothesis, Cohen and Wills (1985) argued that social support can help a person see the situation as less threatening, thus reducing their reaction to stress and helping them cope more effectively. Social networks can be beneficial even in the absence of stress in that they promote the development of

attributes such as self-esteem, self-worth and emotion regulation (Cohen & Wills, 1985).

Many studies have found that social support can be protective against the development of mental health problems following childhood adversities (Murphy, Shevlin, Armour, Elklit, & Christoffersen, 2014; Folger & O'Dougherty Wright, 2013) and conflict related experiences (Dirkzwager, Bramsen, & van der Ploeg, 2003; Wilcox, 2010; Duax, Bohnert, Rauch, & Defever, 2014) in both civilian and military veteran populations (Dinenberg, McCaslin, Bates, & Cohen, 2014; Duax et al., 2014; Platt, Keyes, & Koenen, 2014).

According to Umberson and Montez, (2010) both quality and quantity of social relationships are important for physical and mental wellbeing. In a population-based study, Platt et al. (2014) measured quality of social networks, as well as their size or diversity, to determine the role of social networks in the development of PTSD. The study found that both the quality and quantity of social networks were protective, but the size or diversity of social networks was particularly important. Other studies have found the quality rather than the quantity of social networks being more important for mental health (Vandervoort, 1999). In relation to military populations, veterans and National Guard soldiers with fewer social networks seem to be more likely to have a mental health problem when compared to those with a large number and high perceived social support (Hatch et al., 2013; Sripada et al., 2015). Questions still remain however, whether it is the quality or quantity of social networks that play an important role for military veterans following adverse childhood experiences.

The proposed study aims to examine the mediating role of social networks on the relationship between typologies of childhood adversities and mental health outcomes among U.S. military veterans. The current study builds upon the work of Ross et al. (2018) who examined the

existence of typologies of adverse childhood experiences and their relationship to incarceration in U.S. military veterans. To the best of our knowledge, this is the first study to examine the mediating role of both quality and quantity of social networks on psychopathology (PTSD, major depressive disorder (MDD), generalized anxiety disorder (GAD)) following adverse childhood experiences among military veterans. It is anticipated that those who experience higher levels of childhood adversities will be more likely to have psychological problems than those who did not endure such experiences. However, it is also anticipated that social networks will be protective following such experiences. Furthermore, the study will aim to determine whether it is the quality or quantity of social networks that have the greater impact. Finally, the study will examine the impact of adverse childhood experiences on the formation of social networks in the first instance.

2.0 Method

2.1 Design

The current study used data from the National Epidemiologic Survey on Alcohol and Related Conditions-III (NESARC-III), which was conducted by trained lay interviewers, between April 2012 and June 2013, under the direction of the National Institute on Alcohol Abuse and Alcoholism (NIAAA). The epidemiological study examined alcohol and drug use and disorders, and associated risk factors, along with physical and mental health problems utilising the Alcohol Use Disorder and Associated Disabilities Interview Schedule (AUDADIS-5). Informed consent was obtained from all participants. Ethical approval for NESARC-III was obtained from the Westat Institutional Review Board and the Combined Neuroscience Institutional Review Board of the National Institutes of Health. Ethical

approval to conduct secondary data analysis of the NESARC-III for the current study was obtained from the Ulster University Psychology Filter Ethics Committee.

2.2 Sample

The NESARC-III, a cross-sectional study, was designed to be representative of the adult, non-institutionalised population of the U.S. Multistage probability sampling was utilised to select participants (Grant et al., 2014). Weights were applied to ensure that the sample was representative of the civilian population, based on the 2012 American Community Survey. The overall response rate was 60.1%. A total sample of 36,309 participants, over the age of 18 took part in the survey. Of these, 3,119 identified as military veterans. Veteran status was confirmed if participants indicated that they had served on active duty in the U.S. Armed Forces, Military Reserves, or National Guard in the past, but were not currently serving.

2.3 Measures

2.3.1 Sociodemographic variables

Sociodemographic variables included in the current study were gender, age, race/ethnicity and income. Gender and race/ethnicity (White, non-Hispanic, Black, non-Hispanic, American Indian/Alaska native, non-Hispanic, Asian/Native Hawaiian, other Pacific Islander, non-Hispanic, Hispanic, any race) were utilised as categorical variables, while age and income were utilised as continuous variables.

2.3.2 Adverse Childhood Experiences

The current study examined the co-occurrence of nine different types of adverse childhood experiences, which occurred prior to the age of 18. These were related to

participants' experiences of maltreatment (sexual abuse, physical abuse, physical neglect, emotional abuse and emotional neglect) and dysfunctional household (exposure to interpersonal violence, substance use by an adult in the household, household member's mental health problems and household member's criminality). In NESARC-III, these childhood adversities were examined using a subset of questions from the Childhood Trauma Questionnaire (Bernstein et al., 1994), and the Conflict Tactics Scale (Straus, 1979). Questions enquiring about sexual abuse, physical abuse, physical neglect, emotional abuse, and exposure to interpersonal violence were assessed using a five-point Likert scale ranging from 'never' to 'very often', while emotional neglect was assessed using a five-point Likert scale ranging from 'never true' to 'very often true'. Questions related to a household member's substance use, mental health disorders and criminal behaviour utilised dichotomous responses, with these adversities coded as present if the participant responded 'yes' to each question. See Ross et al. (2018) for further details on the scoring of the childhood adversity questions.

2.4 Diagnostic Assessment

Diagnoses in NESARC-III are made in accordance with the Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5), using a structured diagnostic interview (AUDADIS-5). Fair to moderate concordance rates for PTSD and depressive and anxiety disorders ($\kappa = 0.24\text{--}0.59$) have been found in the NESARC-III sample (Hasin et al., 2015). Screening questions are included at the start of each mental health section, with those who screen positively, asked further questions on individual symptoms.

2.4.1 Posttraumatic Stress Disorder (PTSD)

Following the DSM-5 criteria, to be diagnosed with PTSD participants had to endorse at least one traumatic experience, which they either experienced directly, witnessed it happening to others, or learned about it. Those who met this criterion were subsequently asked questions related to their reactions to their worst traumatic experience. For PTSD to be diagnosed participants had to endorse at least one intrusion symptom, one avoidance symptom, two alterations in cognitions/mood symptoms and two alterations in arousal/reactivity symptoms. .

2.4.2 Major Depressive Disorder (MDD)

For MDD to be diagnosed in accordance with DSM-5 criteria, participants had to report at least five or more depressive symptoms (feelings of depression, worthlessness or guilt, decreased interest or pleasure in activities, fatigue, significant change in appetite or sleep patterns, agitation, problems concentrating, recurrent thoughts of death or suicide) with at least one of these symptoms being depressed mood or diminished interest or pleasure in everyday activities. The symptoms had to be present for at least a full two-week period, they had to cause clinically significant distress and could not be related to the effects of other medical conditions or substance problems.

2.4.3 Generalised Anxiety Disorder (GAD)

For GAD to be diagnosed in accordance with DSM-5, excessive or disproportionate anxiety or worrying had to be present for most days, for at least 6 months. The worrying had to be challenging and be accompanied by a number of physical and cognitive symptoms, including restlessness, lack of energy or fatigue, impaired concentration, sleeping problems, aches and pains or irritability. These symptoms had to result in significant impairment or

distress to the individual and could not be related to substance induced problems or other medical conditions.

2.4.4 Mediators

Social Network Index (SNI) – Quantity of Social Networks

The SNI was used to measure the quantity of social networks. The instrument consists of 12 items related to the number of people in a person's social network, the number of different support networks they are involved with, and the number of social roles the person has (Cohen et al., 1997). The questions examine relationships with a spouse/partner, children, parents, parents-in-law, other close relatives, friends, neighbours, workmates, schoolmates, fellow volunteers, and acquaintances from religious and non-religious groups. For the purpose of the current study, and in line with previous research in this area (Ruan et al., 2008), each social network was assessed, and the number of people participants speak to in that network, at least once a fortnight, either in person or by phone, was calculated. Lower scores indicate reduced numbers of social networks.

Interpersonal Support Evaluation List (ISEL-12) – Quality of Social Networks

The ISEL-12 (Cohen et al., 1985) is a 12-item instrument measuring the quality of social relationships with others using a four-point Likert scale (definitely false, probably false, probably true, definitely true), for example, "There is someone I can turn to for advice about handling problems with my family". Half of the items are positive, while the other half are negative (reverse coded), to minimise response bias. Lower total scores indicate lower quality of social support.

2.5 Analytic plan

The analyses were conducted in Mplus 7.31 (Muthén & Muthén, 1998-2012). Initially, 27 participants were excluded, as they had more than 30% of missing values on the childhood adversity indicators and/or the ISEL-12 items. The EM algorithm in SPSS was used to estimate the remaining missing values on the ISEL-12 items prior to computing ISEL-12 total scores. The missing values on the childhood adversity indicators were dealt with using the full information maximum likelihood method in Mplus. The effective sample consisted of 3,092 veterans.

The data was analysed using latent class analysis, regression analysis and mediation analyses. Weights, stratification and cluster variables were utilised in all analyses (see Grant et al., 2014 for further details). Latent class analysis was conducted with the nine adverse childhood experiences indicators to examine the co-occurrence of adverse childhood experiences among veterans. A range of fit indices were used to determine the optimal number of classes, including AIC (Akaike Information Criterion), BIC (Bayesian Information Criterion), and SSABIC (sample size adjusted BIC). Lower values on these fit indices are preferred, while an entropy value close to one indicates good delineation of classes.

Regression and mediation analyses were used to examine the direct and indirect (through quality and quantity of social networks) impact of the childhood adversity classes on the development of PTSD, MDD and GAD among veterans. These analyses were conducted in three stages:

Model 1: Regression models estimated the direct effects between the adversity classes (predictor variables) and PTSD, MDD and GAD (dichotomous outcome variables).

The covariates (age, gender, race/ethnicity, income) and the mediators (quality and quantity of social networks) were included, but their pathways were fixed to zero.

Model 2: This model builds upon Model 1 in that the direct effects of the covariates (predictor variables) on PTSD, MDD and GAD were freely estimated. The pathways to and from the social network mediators remained at zero.

Model 3: This model builds upon Model 2 as the pathways to and from the social network mediators were freed. This allowed for the examination of the indirect effects of childhood adversities and the covariates on PTSD, MDD and GAD. Additionally, the direct effects of the childhood adversity classes on the social network mediators were examined.

3.0 Results

3.1 Descriptive Statistics

In the effective sample of 3,092 U.S. military veterans, 2,788 were male, 304 were female, and the age ranged from 19 – 90 ($M = 60$, $SD = 16.03$). Overall, 57.2% of veterans earned less than \$60,000 per annum, with 13% earning more than \$120,000. In terms of race/ethnicity, 79.5% of veterans were White, non-Hispanic, 10.5% were Black, non-Hispanic, 6.5% were Hispanic, 1.9% were American Indian/Alaska native, non-Hispanic and 1.6% were Asian/Native Hawaiian/other Pacific Islander, non-Hispanic.

3.2 Latent Class Analysis

Models ranging from one to eight classes were specified and estimated. The fit indices are shown in table 1. The model with four latent classes was optimal, based on lower relative AIC, BIC and SSABIC values when compared to models with fewer classes. Furthermore, the entropy value of 0.790 for the four-class model was good when compared with models with a higher number of classes, while improvements in the fit indices were minimal.

Table 1
Fit indices for childhood adversity Latent Class Models 1-8.

No. of classes	Log-likelihood	AIC	BIC	SSABIC	Entropy	LRT (<i>p-value</i>)
1	-11395.703	22809.406	22863.735	22835.138	-	-
2	-10143.267	20324.534	20439.229	20378.858	0.825	2474.086 (0.0001)
3	-10024.828	20107.655	20282.716	20190.571	0.784	233.968 (0.0100)
4	-9951.821	19981.641	20217.068	20093.149	0.790	144.219 (0.0745)
5	-9927.425	19952.850	20248.642	20092.949	0.632	48.192 (0.4066)
6	-9913.882	19945.763	20301.921	20114.454	0.661	26.754 (0.6276)
7	-9899.244	19936.489	20353.012	20133.771	0.672	28.915 (0.4899)
8	-9886.176	19930.352	20407.241	20156.226	0.691	25.816 (0.4759)

Note: AIC = Akaike information criterion, BIC = Bayesian information criterion, SSABIC = sample size adjusted BIC, LRT = Lo-Mendell-Rubin adjusted likelihood ratio test. The optimal model is highlighted in bold

The four resultant latent classes are depicted in figure 1. Class 1, the largest class, representing 71.4% of the sample, with low levels of all adversities, was labelled the Baseline class. Individuals in class 2 (5.1% of the sample), experienced the highest levels of all adversities,

and this class was labelled the Multi-adversity class. Individuals in class 3 (13.9% of the sample) experienced high levels of adversities related to dysfunctional household such as interpersonal violence and substance use. This class was labelled the Household dysfunction class. Finally, class 4 (9.6% of the sample), was characterised by high levels of adversities related to maltreatment such as physical and emotional abuse and neglect and was therefore labelled the Maltreatment class. Four similar latent classes were found in the Ross et al. (2017) paper. However, the analysis was re-run in the current study due to missing data and therefore a slightly different sample size.

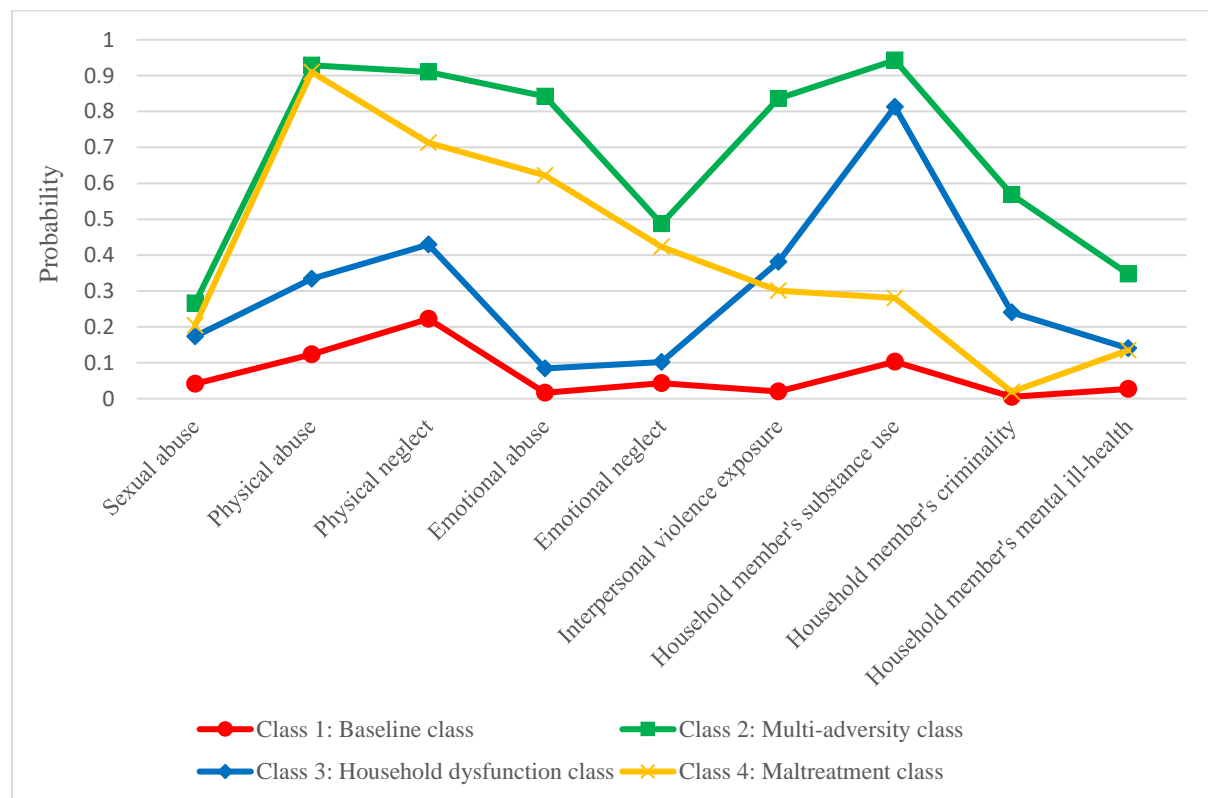


Figure 1
Latent classes of childhood adversity

3.3 Mediation analysis

To determine if quality and quantity of social networks mediate the relationship between adverse childhood experiences and mental health problems, three models were tested, as outlined in the methodology section. To assess the fit of the models a range of fit indices were examined, with lower AIC, BIC and SSABIC values indicating that Model 3 was superior in comparison to Models 1 and Model 2. Chi-square tests using log-likelihood values and scaling correction factors obtained from the MLR estimation, confirmed that Model 3 was significantly superior than Model 2 ($\chi^2 = 217.89$, $df = 22$, $p < .001$).

3.3.1 PTSD

Table 2 shows the direct and indirect effects of adverse childhood experiences on PTSD. In Model 1, the direct effects of the adversity classes were all significant, with individuals in the Multi-adversity class being more than eight times more likely to have PTSD than those in the Baseline class. Those in the Maltreatment class were more than three and a half times more likely to have PTSD and those in the Household dysfunction class were more than two and a half times more likely to have PTSD than those in the Baseline class. When the covariates, gender, age, income and race/ethnicity were included in Model 2, the odds ratios for the effects of childhood adversities on PTSD decreased slightly. Gender, age, income and race/ethnicity were found to be significant predictors of PTSD. Males and older veterans were less likely to have PTSD than females and individuals who were younger. As income increased, the chances of having PTSD decreased. In comparison to those whose race was white, veterans who were black or American Indian/Alaskan native were more likely to have PTSD. In Model 3, only the mediator for quality of support networks (ISEL-12) was included, as no significant association was revealed between quantity of support (SNI) and PTSD in the current study (Baron & Kenny, 1986). When quality of support networks was included, the odds ratios for the direct effect of adversity classes on PTSD reduced further but remained significant, indicating that partial mediation occurred. Quality of

social networks was also a significant predictor of PTSD. A number of significant indirect effects were revealed from the Multi-adversity and Maltreatment classes, and from age and income to PTSD, via quality of support networks (see Table 2).

3.3.2 MDD

The odds ratios for the direct and indirect impact of childhood adversities on MDD are depicted in table 3. In Model 1, those who experienced childhood adversities were significantly more likely to have MDD than those in the Baseline class, with the Multi-adversity class being at the highest risk; they were more than five times more likely to have MDD. In Model 2, when the covariates were included, the odds ratios for the effects of childhood adversities on MDD were reduced. Age and income were also significant predictors; with increasing age and income, the chances of having MDD decreased. In Model 3, when quality and quantity of social networks were included, the odds of the childhood adversities decreased, with the direct effect of the Maltreatment class becoming insignificant. In this case full mediation occurred. The direct effects of the Multi-adversity and Household dysfunction classes also decreased but remained significant, suggesting partial mediation. Quality of social networks was a significant predictor of MDD, while quantity of networks was not. Significant indirect effects were revealed from the Multi-adversity and Maltreatment classes, and also from income to MDD, via quality of support networks.

3.3.3 GAD

The direct effects between the adversity classes and GAD were all significant in Model 1, as shown in table 4. When the covariates were added, in Model 2, the direct effect of the Household dysfunction class onto GAD became non-significant. Gender, age and race/ethnicity were significant predictors of GAD. In Model 3, following the addition of the mediators, the odds ratios decreased, indicating that partial mediation occurred. Quality of social networks was a

significant predictor of GAD, while quantity of networks was not. Significant indirect effects via quality of support networks were revealed for the Multi-adversity and Maltreatment classes, as well as for age and income.

3.4 Predictors of social networks

3.4.1 Quality of social networks

Individuals in all three childhood adversity classes were significantly less likely to have high quality social networks (ISEL-12) than those in the Baseline class. The Multi-adversity class had the lowest levels of quality of networks ($\beta = -0.097$, $SE = 0.026$, $p < .001$), followed by the Maltreatment class ($\beta = -0.080$, $SE = 0.028$, $p < .01$), and then the Household dysfunction class ($\beta = -0.044$, $SE = 0.018$, $p < .05$). Neither gender nor race/ethnicity significantly predicted ISEL scores. Age and income were significant predictors, with younger participants ($\beta = -0.121$, $SE = 0.022$, $p < .001$) and those with higher levels of income ($\beta = 0.178$, $SE = 0.024$, $p < .001$) being more likely to have higher levels of quality of social networks.

3.4.2 Quantity of social networks

Individuals in the Multi-adversity ($\beta = -0.060$, $SE = 0.015$, $p < .001$) and Maltreatment classes ($\beta = -0.053$, $SE = 0.021$, $p < .01$) were significantly less likely to have high levels of quantity of social networks (SNI) than those in the Baseline class. However, no significant findings were revealed for those in the Household dysfunction class. Gender, age and race/ethnicity did not predict quantity of social networks. Higher income ($\beta = 0.117$, $SE = 0.023$, $p < .001$) and being Hispanic ($\beta = -0.035$, $SE = 0.015$, $p < .05$) as opposed to White non-Hispanic were significant predictors of more social networks.

Table 2

Odds ratios and confidence intervals for direct and indirect effects of adverse childhood experiences on PTSD via quality of social networks with covariates of gender, age, income, race/ethnicity

Variable	Direct Effects			Indirect Effects
	Model 1 <i>OR</i> (95% <i>CI</i>)	Model 2 <i>OR</i> (95% <i>CI</i>)	Model 3 <i>OR</i> (95% <i>CI</i>)	Social Networks Quality β (<i>SE</i>)
Childhood adv.				
Multi-adversity Class	8.278*** (5.373-12.753)	6.742*** (4.204-10.812)	6.153*** (3.733-10.140)	0.098 (0.044)*
Household dysfunction Class	2.663*** (1.760-4.030)	2.272*** (1.487-3.472)	2.196*** (1.425-3.383)	0.030 (0.017)
Maltreatment Class	3.665*** (2.503-5.367)	2.951*** (2.003-4.348)	2.793*** (1.872-4.166)	0.060 (0.028)*
Baseline Class	1.0	1.0	1.0	
Gender				
Male		0.640** (0.446-0.919)	0.627* (0.438-0.900)	0.009 ((0.014)
Female		1.0	1.0	
Age (continuous)		0.975*** (0.967-0.983)	0.973*** (0.964-0.981)	0.002 (0.001)**
Income (continuous)		0.944 ** (0.910-0.979)	0.955* (0.919-0.982)	0.010 (0.004)*
Race/ethnicity				
Black		1.458* (1.074-1.980)	1.452* (1.075-1.963)	0.007 (0.010)
American Indian, Alaskan		3.369*** (1.736-6.539)	3.314*** (1.776-6.186)	0.024 (0.042)
Asian/Pacific		1.069 (0.454-2.518)	1.025 (0.437-2.404)	0.021 (0.030)
Hispanic		0.864 (0.553-1.350)	0.830 (0.527-1.308)	0.034 (0.023)
White		1.0	1.0	
Social Networks Quality				
		-	0.965** (0.941-0.990)	

Note: PTSD = Posttraumatic Stress Disorder; *OR* = odds ratio; *CI* = confidence interval; β = beta coefficient; *SE* = standard error, *** $p < .001$; ** $p < .01$; * $p < .05$

Table 3

Odds ratios and confidence intervals for direct and indirect effects of adverse childhood experiences on MDD via quality and quantity of social networks with covariates of gender, age, income, race/ethnicity

Variable	Direct Effects			Indirect Effects	
	Model 1 <i>OR</i> (95% <i>CI</i>)	Model 2 <i>OR</i> (95% <i>CI</i>)	Model 3 <i>OR</i> (95% <i>CI</i>)	Social Networks Quality β (<i>SE</i>)	Social Networks Quantity β (<i>SE</i>)
Childhood adv.					
Multi-adversity Class	5.338*** (3.606-7.903)	4.419*** (2.952-6.616)	4.111*** (2.715-6.225)	0.073 (0.031)*	0.003 (0.019)
Household dysfunction Class	1.906*** (1.319-2.753)	1.694** (2.952-6.616)	1.652* (1.108-2.464)	0.022 (0.014)	0.001 (0.003)
Maltreatment Class	1.699*** (1.234-2.340)	1.474* (1.146-2.503)	1.404 (0.998-1.976)	0.045 (0.022)*	0.002 (0.012)
Baseline Class	1.0	1.0	1.0		
Gender					
Male		0.735 (0.533-1.015)	0.727 (0.527-1.004)	0.007 (0.010)	-0.001(0.003)
Female		1.0	1.0		
Age (continuous)		0.977*** (0.971-0.983)	0.976*** (0.969-0.982)	0.001 (0.000)	0.000 (0.000)
Income (continuous)		0.951** (0.921-0.982)	0.959* (0.928-0.991)	-0.008 (0.003)**	0.000 (0.002)
Race/ethnicity					
Black		0.726 (0.501-1.051)	0.722 (0.501-1.041)	0.005 (0.008)	-0.001 (0.005)
American Indian, Alaskan		1.237 (0.626-2.447)	1.211 (0.601-2.443)	0.018 (0.033)	0.000 (0.003)
Asian/Pacific		0.638 (0.270-1510)	0.616 (0.258-1.475)	0.015 (0.023)	0.000 (0.003)
Hispanic		0.810 (0.516-1.271)	0.788 (0.501-1.239)	0.026 (0.017)	0.002 (0.009)
White		1.0	1.0		
Social Networks					
Quality		-	0.974* (0.954-0.994)		
Quantity		-	0.999 (0.989-1.009)		

Note: MDD = Major Depressive Disorder; *OR* = odds ratio; *CI* = confidence interval; β = beta coefficient; *SE* = standard error, *** $p < .001$; ** $p < .01$; * $p < .05$

Table 4

Odds ratios and confidence intervals for direct and indirect effects of adverse childhood experiences on GAD via quality and quantity of social networks with covariates of gender, age, income, race/ethnicity

Variable	Direct Effects			Indirect Effects	
	Model 1 <i>OR</i> (95% <i>CI</i>)	Model 2 <i>OR</i> (95% <i>CI</i>)	Model 3 <i>OR</i> (95% <i>CI</i>)	Social Networks Quality β (<i>SE</i>)	Social Networks Quantity β (<i>SE</i>)
Childhood adv.					
Multi-adversity Class	3.479*** (1.920-6.302)	2.809*** (1.531-5.156)	2.448** (1.316-4.554)	0.134 (0.053)*	0.008 (0.028)
Household dysfunction Class	1.896* (1.138-3.160)	1.619 (0.966-2.716)	1.539 (0.909-2.606)	0.041 (0.022)	0.001 (0.005)
Maltreatment Class	3.625*** (2.334-5.631)	3.157*** (2.112-4.719)	2.890*** (1.919-4.351)	0.083 (0.035)*	0.005 (0.019)
Baseline Class	1.0	1.0	1.0		
Gender					
Male		0.509** (0.320-0.809)	0.492** (0.309-0.783)	0.013 ((0.018)	-.001 (0.005)
Female		1.0	1.0		
Age (continuous)		0.979*** (0.966-0.989)	0.976*** (0.966-0.987)	0.002 (0.001)**	0.000 (0.000)
Income (continuous)		0.985 (0.933-1.040)	1.001 (0.948-1.057)	-0.014 (0.004)**	-0.001 (0.003)
Race/ethnicity					
Black		0.987 (0.578-1.684)	0.987 (0.584-1.668)	0.009 (0.015)	-0.002 (0.007)
American Indian, Alaskan		1.037 (0.395-2.724)	0.962 (0.339-2.581)	0.033 (0.058)	-0.001 (0.006)
Asian/Pacific		0.069** (0.009-0.521)	0.060** (0.008-0.476)	0.028 (0.042)	0.001 (0.006)
Hispanic		0.985 (0.591-1.642)	0.928 (0.546-1.577)	0.047 (0.031)	0.004 (0.014)
White		1.0	1.0		
Social Networks					
Quality		-	0.952*** (0.926-0.979)		
Quantity		-	0.998 (0.983-1.013)		

Note: GAD = Generalised Anxiety Disorder; *OR* = odds ratio; *CI* = confidence interval; β = beta coefficient; *SE* = standard error, ****p* < .001; ***p* < .01; **p* < .05

4.0 Discussion

Previous studies have examined the protective role social networks can play following childhood adversities and other traumatic experiences (Brewin et al., 2000; Sperry & Widom, 2013; Duax et al., 2014). One particular subgroup, which may potentially benefit from such networks, is the military veteran population, since through their work they often encounter traumatic experiences. Reported levels of childhood adversities are also higher in veterans compared to the general population (Blosnich et al., 2014; Katon et al., 2015), which can have resultant negative effects on psychological wellbeing. The current study found that 71.4% of military veterans experienced low levels of adversities, in comparison to 73% of females and 74% of males in the general population, utilising the same dataset (Cavanaugh, Petras, & Martins, 2015). Therefore, it is important, that the role of both the quality and quantity of social networks, which may be protective, is examined, adding to the knowledge base and informing policy makers and practice, especially those with an interest in veteran health and wellbeing.

The current study aimed to identify profiles of childhood adversities in the U.S. military veteran population, and to examine the mediating role of quality and quantity of social networks in the relationship between these profiles and PTSD, MDD and GAD. The study revealed four profiles of adversity; 1) Baseline, 2) Household dysfunction, 3) Maltreatment, and 4) Multi-adversity classes. In comparison to the baseline class, individuals in the three adversity classes were more likely to have a mental health problem, with those in the Multi-adversity class, who experienced adversities related to both dysfunctional household and maltreatment, displaying the highest rates of psychopathology. This is in

accordance with the extant research in this area (Edwards et al., 2003; Chapman et al., 2004; Afifi et al., 2009; McLaughlin et al., 2010).

A number of socio-demographic factors influenced the findings when included in the model. Male participants were less likely to have PTSD or GAD. Age was a protective factor, with the likelihood of participants having any disorder decreasing with age. Furthermore, as income increased the risk of having PTSD or MDD decreased. Black or American-Indian participants were more likely to have PTSD, while Asian Pacific participants were less likely to have GAD, in comparison to white participants.

When the social network mediators were included in the model, the risk of psychological problems reduced considerably. Quality of social networks was important in relation to all mental health disorders investigated, especially for those who experienced multi-adversity or adversities related to maltreatment. However, quantity of social networks was not a significant protective factor in this study, contrary to some previous findings (Platt et al., 2014; Hatch et al., 2013). Instead, similar to some other studies (Vandervoort, 1999), it was the subjectively perceived quality of social networks, which played a protective role against negative mental health outcomes. Carmichael, Reis, & Duberstein, (2015) found that quality of social networks becomes more important than quantity as people get older, which may partly explain the findings in this veteran population.

The current study revealed however, that while social networks were beneficial following adverse childhood experiences, veterans who experienced adversity, especially those in the Multi-adversity class, were less likely to have good social networks in terms of both quality and quantity. This may be due to the fact that the adversities examined in this

study were related to dysfunctional household and maltreatment, therefore relationships within the family may be poor. A review by Fritz., de Graaff, Caisley, van Harmelen and Wilkinson (2018) reported that immediate family support, cohesion and an overall positive family environment can enhance resilience, thereby reducing the risk of mental health problems following childhood adversities. Extended family support was also an important resilience enhancing factor (Fritz et al., 2018). However, adverse childhood experiences may prevent victims from engaging with others, and building social networks, due to fear and mistrust (Blanchard-Dallaire, & Hébert, 2014). Such findings indicate that childhood adversities impact on psychopathology both directly, and indirectly, as adversity was found to be related to reduced social networks.

It should also be remembered, however, that those with psychological problems may be less likely to engage with others and develop social networks. Research has revealed that veterans who have PTSD often have fewer people in their social networks, as a result of their experiences and symptoms (Duax et al., 2014). This may be particularly significant for female veterans who have very high levels of PTSD (Lehavot, Katon, Chen, Fortney, & Simpson, 2018), which may subsequently impact on their relationships with others. Mood and anxiety disorders can also impact on the development and maintenance of social networks, both within the family, with friends, and in the wider community setting. Moreover, in comparison to civilians who experience childhood adversities, veterans who endure similar experiences have been found to be more likely to have alcohol related problems (Evans et al., 2018), which may subsequently impact on the retention of social networks. Additionally, those who endured adverse childhood experiences may be more likely to have drug abuse problems later in life (Dube et al., 2003b), which again may impact on the formation and maintenance of social networks.

King, Taft, King, Hammond and Stone (2006) found that interpersonal problems related to PTSD can influence both the quality and quantity of social support networks. The longitudinal study found that it was not necessarily low levels of social support that impacted on recovery. Instead, PTSD impacted on social support prospectively. Duax et al. (2014) discussed the erosion model, when people with PTSD push away these protective social networks. Indeed, as research has shown, many veterans have elevated levels of mental health problems, and as a result, can have marital or parenting problems, or problems with relationships in general (Duax et al., 2014). Following traumatic experiences, a lack of adequate support or social networks can result in the person withdrawing further from society, which can increase the likelihood of them developing a mental health problem or it may exacerbate pre-existing problems. However, as the current study shows, the quantity of social networks is not as important as the quality of social networks, therefore it is vital for veterans to develop and maintain even a few quality-based social networks.

Limitations and future research

While the study provides some important findings, several limitations should be considered when interpreting the results. Firstly, the study is cross-sectional, relying on retrospective reporting of adverse childhood experiences, which could have resulted in some inaccuracies. In a similar vein, whilst we can infer temporal ordering in this study as some of the questions relate to early childhood experiences, while military experiences occurred later, longitudinal research is required to fully determine the direction of influence. Social support

can buffer against negative life events, for example childhood adversities, but such experiences and associated mental health problems, may prevent the person from developing and maintaining these important networks in the first place. It would be beneficial to examine social networks prior to deployment and then follow up post deployment, to establish what changes may occur, and to determine how best to support veterans across their military career and beyond. Further research which includes the role of conflict related traumas would also be beneficial, as these traumatic events may also impact on social networks.

Furthermore, many veterans appear to use social media to keep in touch with their peers (Irani, 2010) and to look out for each other (Hauser, 2016). This mode of communication was not assessed in the questionnaire used in the current study. Further research into the use of social media, and the protective role it may play in the veteran population is therefore warranted. Moreover, it would be beneficial to examine the role of social networks in the general population using NESARC-III, comparing findings for both veteran and non-veteran participants, since veterans have slightly higher rates of childhood adversities, which, as revealed in this study can impact on the development of social networks.

Implications

Despite these limitations, the study shows the importance of the quality of social networks (as opposed to the quantity of networks) following adverse childhood experiences, as such networks can be protective, leading to fewer psychological problems. Social networks may be particularly important for military veterans, helping to protect them following

traumatic experiences. While pre-deployment screening includes assessments for mental health problems, research would suggest that it is also important to screen for childhood adversities (Sareen et al., 2013), thereby informing treatment plans early in a person's military career. Furthermore, it is important to promote programmes which aim to prevent or reduce the occurrence of childhood adversities in the first place. As the current study shows, such experiences can impact on the development and maintenance of social networks which may protect individuals in times of stress.

The study demonstrates the importance of helping those affected by trauma, to establish and retain these important relationships through the development of effective prevention and intervention strategies (Ray & Vanstone, 2009). As discussed, social networks are particularly important for those leaving the military service, especially for certain demographic groups, such as females, younger veterans and those with a lower income. Programmes which may help military personnel develop or enhance interpersonal skills might be beneficial. It is crucial for service leavers to be able to address potential changes in relationships with family and friends and for family members to be involved in the transition process. Furthermore, for many, strong camaraderie while in the military may lead to a sense of loss when personnel leave and it is important therefore to encourage veterans to stay in contact, perhaps through various social media platforms or local groups. When integrating back into the community veterans should be encouraged to engage with that community, perhaps through volunteering or getting involved in community work, which may enhance their self-esteem and self-worth, as well as providing them with the opportunity to develop social networks, which may benefit them across the lifespan.

Conclusions

Since elevated levels of childhood adversity were found in this veteran population and such experiences were related to poorer mental health outcomes, the study shows that it is important to address these issues early in life. Social networks, especially quality of social networks can be protective, however, as the study shows, adverse experiences can hinder the development of social networks in the first place. It is essential therefore to intervene early, helping those affected by trauma to gain the skills to develop and maintain healthy social networks.

Conflicts of Interest

None

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